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ABSTRACT

This study was conducted to examine high school teachers' perceptions of self-efficacy and ways in which self-perception is affected by: (1) differences in the characteristics of classes taught; (2) differences in the organizational environments in which teachers work; and (3) interactions that neutralize the negative effects of difficult classes. Data were gathered in a sample of 14 urban and suburban high schools in California and Michigan. A questionnaire was mailed to all teachers and included a series of questions on: perceptions of self-efficacy for each class taught; the characteristics of each class; personal and professional background; and the organizational setting of the school. The final sample included 263 teachers who provided information about 1,026 classes taught. Findings suggest that different levels of self-efficacy result from different classes and depend on: (1) preparation and knowledge of subject matter; (2) the ability of students; (3) student engagement; (4) collaboration with colleagues; and (5) increased teacher control over working conditions. The data imply that assignment of teachers to low-track classes presents challenges that make it difficult for them to maintain elevated perceptions of self-efficacy. This is true particularly of the most advantaged teachers (highly educated and white). (LL)

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CONTEXTUAL EFFECTS ON THE SELF-EFFICACY OF HIGH SCHOOL TEACHERS

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Abstract

Teaching is commonly assumed to involve substantial technical uncertainty. As a result, effective teaching requires not only knowledge and skills, but also self-efficacy: a judgement of one's capability to effect a desired level of performance. This study of high school teachers' sense of efficacy demonstrates that this self-perception is affected by: (a) differences in the characteristics of classes taught by the same teacher; (b) differences in the organizational environments in which teachers work; and (c) "setting-by-teacher" interactions that neutralize the negative effects of difficult classroom settings on teachers' self-efficacy. These results are contrasted with results from previous research on teachers' self-efficacy, and the implications of the findings for school reform are discussed.

Despite recurrent attempts to routinize the act of teaching through "teacher-proof" curricula and "direct instruction" protocols, a central feature of classroom instruction is uncertainty. In most classrooms in most schools in most countries, effective schooling requires that individual teachers generate efficacious instructional performances under a wide variety of unpredictable circumstances (Bidwell, 1965; Brophy and Evertson, 1976).

The enduring dependence of educational outcomes on the varying capacities of teachers to cope successfully with classroom uncertainties has encouraged researchers to search for various dimensions of pedagogical and subject-matter knowledge that underlie effective teaching (Shulman, 1987). If reformers cannot improve instruction by prescribing teacher behavior, they might do so by strengthening the knowledge base upon which teachers can draw, empowering them to cope with myriad instructional challenges which even the most experienced teacher cannot anticipate.

However, current research on self-referent thought warns against the presumption that the possession of knowledge and skills alone is sufficient for efficacious teaching. Bandura (1986), for example, argues that the possession of knowledge and skills needed to perform an act does not, in and of itself, guarantee that an actor will produce an efficacious performance. Effective action depends also upon the personal judgement that one can mobilize such knowledge and skills in order successfully to perform an act under varied and unpredictable circumstances. Bandura defines this judgement as <u>perceived self-efficacy</u>, a cognition which mediates between knowledge and action.

In recent years, teachers' self-efficacy has emerged as an important

topic in educational research (Ashton and Webb, 1986; Dembo and Gibson, 1985; Fuller, Wood, Rapoport, and Dornbusch, 1982; Newmann, Rutter, and Smith, 1989; Raudenbush and Bhumirat, in press). This research has linked teachers' sense of efficacy to effective teaching performance and to student outcomes, and it has begun to examine how schools as formal organizations can be designed to enhance teacher self-efficacy. As a result, educational policy makers have become increasingly interested in promoting school reforms that lead to increased feelings of efficacy among teachers (see, e.g., Rosenholtz, 1985).

This paper extends previous research on teacher self-efficacy in several ways. First, it employs a definition of self-efficacy that differs in subtle but important ways from the definitions used in previous educational research. In previous studies, there has been a tendency to equate teacher self-efficacy with expected instructional outcomes. For example, Fuller et al. (1982: 6) defined self-efficacy as "the individual's perceived expectancy of obtaining valued outcomes through personal effort." Similarly, Dembo and Gibson (1985: 173) described teacher self-efficacy as "the extent to which teachers believe they can affect school learning." And Newmann et al. (1989: 223) referred to a teacher's sense of efficacy as "the teacher's perception that his or her teaching is worth the effort, that it leads to the success of students and is personally satisfying."

By contrast, we follow the pioneering work of Bandura (1986: 391), who sharply distinguishes between perceived self-efficacy and outcome expectations. "Perceived self-efficacy," he writes, "is a judgement of one's capability to accomplish a given level of performance, whereas an outcome expectation is a judgement of the likely consequences such behavior

will produce." This distinction has important implications for research on teacher self-efficacy. Two teachers who feel equally competent to provide a particular level of performance in classrooms might nonetheless make different predictions about the likely outcomes of such a performance. In this paper, the focus is on the former: the sources of variation in the teachers' judgments that they can provide a desired level of instructional performance.

We depart from previous research in another important respect. Past studies have tended to treat teachers' sense of efficacy as a stable or global trait, and teachers have been classified as having either "high" or "low" efficacy. However, as Bandura (1986: 411) notes, self-efficacy is not a global disposition. Instead, "some situations require greater skill and more arduous performances, or carry greater risk of negative consequences, than others." As a result, Bandura writes, "Different persons with similar skills, or the same person on different occasions, may perform poorly, adequately, or extraordinarily" (1986: 391).

This insight has important implications for research on teacher self-efficacy, particularly research undertaken in the secondary school setting. In high schools, virtually all teachers face a number of different classes each day, and these classes often vary in subject matter, in the grade level or academic capabilities of students assigned to the class, and in class size. Each class poses a somewhat different set of circumstances and challenges. The self-efficacy of the teacher may be expected, therefore, to vary across these classes, so that each teacher may be viewed as having a personal "distribution" of perceived self-efficacy. These distributions provide the object of study in this paper. We seek to discover why the same

teacher will vary across classes in self-perceived efficacy; and, after holding constant the circumstances of the class, why different teachers will vary.

Finally, our approach seeks to extend current research on the linkage between school organization and teacher self-efficacy. Previous research suggests strongly that the curriculum of US high schools is typically differentiated on the basis of students' prior achievement, and that teachers have difficulty maintaining high levels of self-efficacy in classrooms attended by low-achieving students (Ashton and Webb (1986). The systematic assignment of students to classes on the basis of prior achievement and the dependence of teacher self-efficacy on student achievement may work together to deprive low-achieving students of effective instruction.

Ashton and Webb (1986) found, however, that not all teachers suffer reductions in self-efficacy when assigned to teach low-achieving students. In that study, teachers' capacities to devise new strategies and enhanced levels of effort to cope with challenging teaching assignments seemed to depend on organizational conditions outside the classroom. It may be that organizational settings that provide administrative support, that enable teachers to control their working conditions and that foster collaboration with colleagues can enable teachers to cope more effectively with low-achieving classes. This paper set out to investigate these organizational effects, and, in doing so, to control for differences in teachers' background and training which may also influence self-efficacy.

In summary, then, this paper follows from and attempts to extend previous research on teachers' sense of efficacy. Because high school

teachers teach different classes across the course of a school day, and because these classes often present teachers with more or less difficult circumstances, we examine not only global differences among teachers in self-efficacy, but also the extent to which a given teacher's sense of efficacy varies across classes. In addition, we examine how organizational support and teacher background affect global differences among teachers in self-efficacy, and we test the hypothesis that organizational support equips the teacher to cope effectively with classes attended by low-achieving students.

Approach and Hypotheses

We gathered data on the self-efficacy of high school teachers in a sample of 14 urban and suburban high schools in California and Michigan. We asked teachers to report their perceptions of self-efficacy for each of the classes they taught and to report on various characteristics of these classes. We also inquired about their personal and professional background and their perceptions of the organizational setting in which they worked.

Our analytic approach is based on the two-level hierarchical linear modelling framework described by Raudenbush and Bryk (1988). This approach allows decomposition of the variance in teachers' self-perceived efficacy into two components: an intra-teacher component that reflects variance in a given teacher's sense of efficacy across classes, and an inter-teacher component that reflects variation in the relatively stable or global component of self-efficacy that varies across teachers. We then investigated a series of hypotheses by expanding this two-level model to include independent variables measured at the class level and the teacher

level of analysis. The hypotheses and their rationale are provided below.

Intra-Teacher Variation

Because we viewed teachers' self-efficacy as contextually situated rather than global, we expected substantial intra-teacher variation across classes in self-perceived efficacy. Assuming that the intra-teacher component of variation was indeed large, we then sought to test hypotheses about why a given teacher will vary in self-perceived efficacy across classes.

Perhaps the most direct predictor of self-perceived efficacy is the academic engagement of a teacher's students. The teacher's perception of student engagement in a class provides an immediate and continuous source of feedback on the efficacy of the instruction. Ashton and Webb (1986) suggest that teachers often begin their careers with high hopes for teaching "difficult" students. But because many teachers often lack the means to sustain the academic engagement of these students, they come to see the task of teaching as ever more difficult, and thus to adjust downward their self-perceptions of efficacy. These insights were later supported by Newmann et al. (1989), who cited classroom order as a key predictor of teacher efficacy.

Other class-level variables may predict self-efficacy, in part indirectly, by affecting engagement. These include student achievement, student age, level of preparation, and class size. We discuss each below.

Student achievement. Teaching low-achieving students would seem necessarily to require greater skill and to carry a greater risk of failure than would teaching highly able students. For this reason, teachers may doubt their capacity to teach well in low-achieving classes. Ashton and Webb

(1986) write:

"Compared to average or above-average pupils, low-achieving pupils are more difficult to manage, more likely to show anger, and more likely to direct their anger at their classmates and the teacher. They are unlikely to work hard to show interest in class activities or assignments. Teachers must struggle to win their trust and friendship, and helping reluctant learners master academic material is an arduous affair" (page 66).

Assignments to low-achieving classes would seem especially to undermine self-efficacy if such assignments were given systematically to teachers whom administrators view as less capable. Bandura argues that "When people are cast in subordinate roles or assigned inferior labels implying limited competence, they perform activities at which they are skilled less well than when they do not bear the negative labels of the subordinate role designations" (page 449).

Student age. In field interviews undertaken as part of this study, teachers often compared freshman and sophomores with more advanced students and noted that on average, older students were more mature, more consistently engaged, and easier to manage than their younger counterparts. As a result, it makes sense to assume that teachers would have a higher sense of self-efficacy when teaching older students.

Level of preparation. In high schools, teachers often teach multiple preparations, and the teacher's training and intellectual interests may match more or less well with the subject matter of any given class. Hence, we predicted that teachers will feel more efficacious in classes for which they feel better prepared.

Class size. We also predicted that class size will affect teachers'

feelings of self-efficacy, in part because it may be more difficult to manage students and to sustain student engagement in larger classes.

In the analyses below, we examine the causal ordering of these factors. Most of the research reviewed above suggests that students' age and achievement, as well as teachers' level of preparation and class size, might affect the perceived self-efficacy of teachers only indirectly, that is, primarily through effects on student engagement. If this is the case, once engagement is controlled in predicting teacher self-efficacy, the effects of these other variables on self-efficacy should disappear or diminish greatly.

Inter-Teacher Variation

Viewing self-efficacy as varying across classes for each teacher encourages a reformulation of the possible sources of variation among teachers in self-efficacy. In the two-level hierarchical analysis undertaken here, variation among teachers reflects variation in teacher means across classes. That is, a teacher is high in self-efficacy because the average level of self-efficacy reported in his or her classes is high. Using the language of analysis of variance, such among-teacher variation can arise from three sources: (a) main effects of classroom setting; (b) main effects of teacher-level variables; and (c) classroom setting-by-teacher interactions.

Main effects of classroom setting. Variation among teachers in self-efficacy could result simply from the fact that some teachers face less challenging classes than others. This could result because the students they are assigned to teach are, on average, higher achieving, older, or more engaged or because, on average, these teachers are assigned

to smaller classes or classes for which they highly prepared. Teachers who are high on mean self-efficacy for these reasons are not "high efficacy" teachers; instead they are simply fortunate to face relatively favorable classroom circumstances.

Main effects of teacher-level variables. Alternatively, variation among teachers in self-efficacy might be due to factors that are invariant across classes and thus are seen in this paper as characteristics of teachers. In the paragraphs below, we consider two sets of such characteristics.

The organizational environments in which teachers work might affect levels of self-efficacy, controlling for the characteristics of the classes taught by each teacher. Environments in which teachers are provided with the requisite technical support to enact their preferred teaching strategies may enhance self-efficacy (Ashton and Webb, 1986; Fuller et al., 1982; Newmann et al., 1989). These environments are especially likely to be present when teachers experience supportive leadership from administrators, when they have the opportunity to participate in decisions that shape classroom working conditions, and when they have the opportunity to collaborate and share information with colleagues.[1]

In estimating effects of organizational characteristics, it is important that teachers' personal backgrounds are taken into account. A

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[1]Although it might appear desirable to consider school organization variables as school-level variables, our own experience using measures of organizational structure similar to these employed here suggests that not all teachers in the same school face similar organizational environments (Rowan, Raudenbush, & Kang, in press). Thus, in the current analysis, properties of school organization are entered into our models as properties of teachers and represent teacher perceptions of organizational structure.

number of characteristics of the social backgrounds of teachers might affect their level of knowledge and skill in the classroom and thus their level of confidence in teaching. For example, we might expect more highly educated teachers to feel more efficacious, on average, than less educated teachers. Also, different socialization experiences associated with teacher race and sex may leave some teachers more confident than others in their ability to enact desired teaching performances.

Setting-by-teacher interaction effects. Differences among teachers in perceived self-efficacy might also result from an interactions between classroom setting and teacher characteristics. For example, two teachers might feel equally efficacious in favorable classroom settings, but one may feel more confident than another when circumstances turn unfavorable. This may result, for example, because the more confident teacher is better able to effect preferred teaching strategies when teaching low-achieving pupils. Given identical teaching assignments, the difference in self-efficacy between these two teachers when they are teaching in unfavorable circumstances will show up also as a mean difference in self-efficacy across classes. Such a difference may be viewed as a setting-by-teacher interaction effect: the effect of a particular classroom setting depends on the characteristics of the teacher.

In this paper, we are interested in two kinds of setting-by-teacher interactions. The first involve interactions between student achievement levels and organizational environments. In particular, support from administrators, collaboration with other colleagues, and control over organizational policies about student behavior, curriculum, instructional grouping, text selection, teaching techniques, and inservice offerings all

might enable teachers to tackle some of the difficulties associated with teaching low-achieving students, thus reducing the typical negative effects of such classroom settings on teachers' self-perceived efficacy.

Although our interest focuses on organizational environments, it makes sense also to take into account teachers' personal backgrounds as we examine setting-by-teacher interaction effects. For example, it seems reasonable to assume that a teachers' educational background will affect a teacher's ability to cope with low-achieving students. That is, more highly educated teachers might possess more knowledge, skill, and confidence and thus, in comparison to less-educated teachers, might perceive that they are better able to enact desired teaching strategies when teaching classes in such challenging settings. Put differently, we are interested in investigating the extent to which the educational and social background of teachers neutralizes the effects of low student achievement on teachers' sense of efficacy.

In summary, we have developed a number of hypotheses about the variation in teachers' sense of efficacy. We predict that teachers' sense of efficacy varies across the different classes they teach (intra-teacher variation) and that it varies among teachers (inter-teacher variation). We assume that intra-teacher variation is affected directly by the level of engagement of students in each class, and affected directly or indirectly by the relative level of achievement of students assigned to a class, the age of these students, the size of the class, and a teachers' preparation to teach a given class. Once these factors are taken into account, we assume that inter-teacher variation results from the effects of school organizational environments and teachers' backgrounds. We are also

interested in "setting-by-teacher interaction effects." In particular, we hypothesized that teachers who work in organizational environments characterized supportive administrators, high levels of staff collaboration and significant teacher control over the conditions of teaching, would display greater self-perceived capacity to cope with classes attended by low-achieving students.

Method

To test these hypotheses we used data gathered as part of a larger investigation of the context of secondary school teaching. The sample of 14 schools used in the study was drawn purposefully to guarantee diversity in secondary school teaching contexts in terms of state policies, district resources, school organization, and student composition.

Within each school, all teachers were mailed a questionnaire which included questions on teachers' social and educational backgrounds and perceptions of their organizational environment. The questionnaire also included a series of questions about each of the classes a teacher was assigned to teach. After listwise deletion of cases with missing values, the final sample included 263 teachers who provided information about 1026 classes taught.

Independent and Dependent Measures

Characteristics of classroom settings. Table 1a presents descriptive statistics on variables measuring the characteristics of classroom settings. The table shows that the average class size was 24.9 students (s.d. = 6.98). Student grade level ranged from 1 = freshman to 4 = senior (mean = 2.51; s.d. = .94). Teachers were asked to compare the average level

of achievement of students in each of their classes with the average level of achievement of students in the school as a whole, and the responses were coded as 1 = below average, 2 = average, and 3 = above average. Variables describing the level of preparation of teachers for a particular class and the subject taught by a teacher were coded as dummy variables as indicated in Table 1a. Finally, teachers were asked about the level of student engagement in each of the classes they taught. Specifically, teachers were asked, "About what percent of the students in this class are actively engaged?" Teachers were asked to write in the percent. Responses ranged from 2 percent to 100 percent, but responses less than 60 percent were rare and recoded to equal 60. The resulting recoded variable was quite symmetrically distributed (mean = 82.3; s.d. = 14.0).

The primary outcome measure in this study, teachers' perceived self-efficacy, was also measured at the class level. A measure of this perception was taken from teachers' responses to the following item: "To what extent do you feel successful in providing the kind of education you would like to provide for the students in this class?" Response options included not successful, slightly successful, moderately successful, and highly successful. However, responses to the first two categories were rare, and a binary coding scheme was adopted in which 40 percent of the responses were coded as very successful and 60 percent were coded as other than very successful.[2]

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[2]The analysis procedure employed here was designed for normally distributed errors in predicting the outcome, in our case self-perceived efficacy. When these errors are non-normal, as they surely will be when the outcome is binary, hypothesis tests must be approached with extreme caution. As in standard regression models, the key determinant of the acceptability of the point estimates is the overall proportion of "successes:" when this proportion is not too far from .50, as they are in this case, the accuracy

Teacher-level variables. Table 1b presents descriptive statistics for variables measured at the teacher level. The first set of variables describe the educational and social backgrounds of teachers. Teachers in the sample were highly experienced (mean = 20.2 years of experience) and highly educated (68 percent with a masters degree). In addition, most of the teachers in the sample were white, and slightly over half were male.

The second set of teacher-level variables consisted of three scales measuring teachers' perceptions of their organizational environment. The items in these scales are identical to items used in the Administrator-Teacher Supplement to the High School and Beyond study and are very similar to the scales developed by Pallas (1988) as modified by Rowan, Raudenbush, and Kang (in press). Principal Leadership was measured by a 13-item scale with items indicating such diverse principal activities as effectively coping with outside pressures, setting priorities, recognizing, encouraging, and supporting staff, and involving staff in decision making. Internal consistency was .91. Staff Cooperation was measured by a scale including six items indicating the extent to which staff members help each other in diverse duties, share beliefs and values about the central mission of the school, maintain uniformly high standards of performance for themselves, and seek new ideas. Internal consistency was .83. Teacher Control is a nine-item scale indicating teacher control over school and classroom policy, including student behavior codes, content of inservice programs, student grouping, school curriculum, text selection, teaching content and

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of the estimates will be acceptable. Our discussion of results avoids assigning probability levels to point estimates, and we judge the relative importance of these estimates in an approximate way, assessing the ratio between them and their estimated standard errors.

techniques, and amount of homework assigned. Internal consistency was .72.

Results

Data were analyzed within the framework of a two-level hierarchical linear model using the computer program HLM (Bryk, Raudenbush, Seltzer, and Congdon, 1988). The logic of this methodology and applications are reviewed in Raudenbush and Bryk (1988). Applying this analytic framework to the present problem involves the formulation of two models: a within-teacher model and a between-teacher model. The within-teacher model specifies predictors of intra-teacher variation. Coefficients of the within-teacher model become the dependent variables in the between-teacher model. Below we report results of four such models formulated to test the key hypotheses of the study. These results are summarized in table 2.

Insert Table 2 About Here

Base-Only Model

This first model decomposes the total variance in self-perceived efficacy across the 1026 classes into two components: variation within teachers ("intra-teacher variation") and variation among teachers ("inter-teacher variation"). If teachers' sense of efficacy were contextually situated, as hypothesized, the intra-teacher component would be substantial. The appropriate within-teacher model is remarkably simple:

$$(\text{SELF-EFFICACY})_{ij} = \text{TBASE}_j + e_{ij}, \qquad (1)$$

where $(\text{SELF-EFFICACY})_{ij}$ is the perceived self-efficacy of teacher j in the context of class i; TBASE_j is teacher j's average self-efficacy; and e_{ij} is

the deviation of $(\text{SELF-EFFICACY})_{ij}$ from that teacher's mean. Hence, a positive value of e_{ij} implies that teacher j feels more efficacious in teaching class i than that teacher feels, on average, across his or her classes. The variance of e_{ij}, denoted $\text{Var}(e_{ij}) = \sigma^2$, is the "intra-teacher" variance in self-efficacy.

The between-teacher model is just

$$\text{TBASE}_j = \text{BASE} + u_j, \qquad (2)$$

where BASE is the grand mean self-efficacy across all classes and all teachers, and u_j is the deviation between teacher j's mean self-efficacy and the grand mean. Hence, a positive value of u_j implies that teacher j's self efficacy, averaged across that teacher's classes, is higher than the overall teacher average. The variance of u_j, denoted $\text{Var}(u_j) = \tau^2$, represents the "inter-teacher" variation in self-efficacy. Of obvious importance is the magnitude of σ^2 relative to τ^2, indicating the magnitude of intra- to inter-teacher variation in self efficacy.

The results of this analysis are found in Table 2 under the column labelled "Model 1: Base Only." The estimated intra-teacher variation is $\hat{\sigma}^2 = .106$ while the estimated inter-teacher variation is $\hat{\tau}^2 = .139$. Thus, about $.106/(.106 + .139) = .43$ or 43 percent of the total variation in perceived self-efficacy across the 1026 classes observed is intra-teacher variation. This result confirms our expectation that perceived self-efficacy has a large contextually situated component. Note also that the grand mean for perceived self-efficacy (TBASE_j in Equation 2) is .415, indicating that on average, teachers reported feeling "very successful" in providing students with the kind of education they would like 41.5 percent of the time.

Intra-Teacher Prediction Model

In the next step of the analysis, we examined the extent to which variables measured at the class-level accounted for intra-teacher variation in perceived self-efficacy. We temporarily defer consideration of the effect of student engagement. For this analysis, we simply expand Equation 1 by entering the class-level predictor variables. The expanded within- teacher model is

$$(\text{SELF-EFFICACY})_{ij} = \text{TBASE}_j + \beta_1(\text{SACHIEVE})_{ij} + \beta_2(\text{GRADE})_{ij} + \beta_3(\text{CLASS SIZE})_{ij} + \beta_4(\text{PREPARATION})_{ij} + e_{ij}. \quad (3)$$

According to this model, the self-efficacy of teacher j in class i now depends not only on that teacher's base but also on the achievement level, $(\text{SACHIEVE})_{ij}$, and grade level, $(\text{GRADE})_{ij}$, of the students; the size of the class, $(\text{CLASS SIZE})_{ij}$; and the level of preparation, $(\text{PREPARATION})_{ij}$ of the teacher for that class. We predicted that the regression coefficients β_1, β_2, and β_4 would be positive and that β_3 would be negative.

Notice that the term TBASE_j now takes on a different meaning from the meaning it had in the "base-only" model. Whereas TBASE_j had been the mean self-efficacy for teacher j, it is now the adjusted mean, that is, the expected value of self-efficacy for that teacher, controlling for SACHIEVE_{ij}, GRADE_{ij}, and CLASS SIZE_{ij}. We might say that TBASE_j represents the teacher's mean self-efficacy, after adjusting for the settings to which that teacher is assigned. In this analysis we estimated the average level of TBASE_j and the extent of variation around that average. Thus the between-teacher model remained the same as in Equation 2.

The term e_{ij} of Equation 3 also has a different meaning than it had in

Equation 1. Now e_{ij} is the residual, that is, the error in predicting self-efficacy using not only $TBASE_j$ but also using $SACHIEVE_{ij}$, $GRADE_{ij}$, CLASS $SIZE_{ij}$, and $PREPARATION_{ij}$. Hence, $Var(e_{ij}) = \sigma^2$ is now the <u>residual variance</u>, that is, the intra-teacher variation not explained by these three variables.

Table 2 shows that in each case, the estimates of regression coefficients are in the predicted direction (we shall refer to estimated regression coefficients as "b"; and to the estimated standard errors of these coefficients as "se"). First, there is a substantial effect of student achievement on self-efficacy, with the average or "base" level of this effect across teachers estimated to be b = .176, or 9.78 times its estimated se of .018. Clearly, teachers' sense of efficacy varies with the level of achievement of students in the various classes that they teach, with teachers feeling more self-efficacy in high-achieving classes. There is also a substantial positive effect of level of preparation on perceived self-efficacy, with the average or effect across teachers estimated at b = .346 or 8.65 times its estimated se. The estimated coefficients for effects of student grade level and class size were both in the predicted direction, but both estimates were less than twice their estimated standard errors, suggesting that neither of these variables exercises much influence on teachers' self efficacy.

A comparison of the unconditional intra-teacher variance yielded by the base-only model and the residual intra-teacher variance yielded by the intra-teacher-variation model provides evidence of the explanatory power of these three variables in accounting for intra-teacher variation. Table 2 shows that this residual variance is estimated to be .087, indicating that

the four predictors entered in Equation 3 accounted for about (.106 - .087)/.106 = 18 percent of the intra-teacher variance in perceived self-efficacy.

The Effects of Student Engagement

In the next step of the analysis, we added a variable measuring teachers' perceptions of student engagement to the within-teacher model. This yields an equation which is identical to Equation 3 except that an additional predictor variable is included in the model. The purpose of this addition was not only to estimate the effect of perceived student engagement on self-perceived efficacy, but also to examine the extent to which the effects of the other class characteristics on perceived self-efficacy were indirect. The results of this analysis are presented in Table 2 under the heading "Model 3: Student Engagement."

The results confirm our hypothesis that student engagement is strongly and positively associated with self-perceived efficacy. The estimated regression coefficient for this relationship (b = .011) is nine times its estimated standard error. The results only partially confirm our assumption of indirect effects. Once student engagement was entered, the student achievement effect on teacher efficacy was diminished sharply, although the regression coefficient, b = .063 was still three times its estimated se. The effect of teacher preparation, on the other hand, did not change much after entering student engagement (compare columns two and three).

Adding student engagement to the model led to a small reduction in the residual variance for the within-teacher model ($\hat{\sigma}^2$ = .082, down from .087 in column 2). However, adding student engagement did lead to a fairly

substantial reduction in the between-teacher portion of the model (τ^2 = .109, down from .139 in column 2), indicating that there is substantial between-teacher variation in teachers' perceptions of student engagement and that this helps explain global ("inter-teacher") differences in self-perceived efficacy.

Inter-Teacher Model

In the next step of the analysis, we turned to an examination of between-teacher differences in self-perceived efficacy. In this step, two parameters from the within-teacher model shown in column 3 of Table 2 are used as dependent variables, with independent variables in the analysis representing teacher-level variables. In particular, we estimated two equations:

$$TBASE_j = BASE + f(\text{teacher-level variables}) + u_j \quad (4)$$

and

$$\beta_{1j} = BASE + f(\text{teacher characteristics}) + v_j. \quad (5)$$

The first equation in this pair tells us that TBASEj, the adjusted mean self-efficacy of teacher j, depends upon certain teacher-level variables, including properties of the organizational environments in which teachers work and teachers' personal background characteristics, plus a residual, u_j. The variance of u_j, or $Var(u_j) = \tau^2$, when compared to the τ^2 of the "base-only" model, provides evidence of the capacity of the explanatory variables in accounting for the between-teacher variation in $TBASE_j$.

The second equation of the pair formulates a regression coefficient, β_{1j}, as the outcome. (Notice that β_{1j} now has the subscript j because it is hypothesized to vary across teachers.) This coefficient represents the strength of the association between the level of achievement of teacher j's

students and teacher j's self-efficacy. A large and positive value of β_{1j} indicates that teacher j's self-efficacy is heavily dependent upon the level of achievement of students assigned to her classes, indicating that she is substantially more likely to feel efficacious when assigned to high achieving than to low-achieving classes.[3]

This expanded between-teacher model allows assessment of a number of hypotheses. First, the model can be used to assess the extent to which the properties of teachers' organizational environments and teacher background variables predict teachers' base level of self-efficacy, $TBASE_j$. Second, the model can be used to examine the extent to which these same independent variables also affect the relationship between student achievement and self-efficacy. To the extent that these variables affect β_{1j}, we will have discovered a "setting-by teacher" interaction discussed previously. In the present analysis, we are particularly interested in the extent to which the properties of the organizational environments in which teachers work act to decrease this relationship between student achievement and self-efficacy, for this implies that these organizational characteristics may act to neutralize the deleterious dependence of teacher self efficacy on the achievement levels of the students one is assigned to teach.

We turn first to the analysis of the effects of indicators of the organizational settings in which teachers work. Here, three variables, principal leadership, teacher collaboration, and teacher control over instruction- related policies, were considered. The data provided some

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[3]Note that $Var(v_j)$ represents the variance across classes in the β_{1j} coefficients. It was impossible to estimate this variance well given our data, which has only about four to five observations per teacher. Hence, we constrained this variance to be zero.

support for our hypotheses (see Table 2 under the heading "Inter-Teacher"). For example, although principal leadership had no effects either on TBASEj or β_{1j}, the other two features of school environments did affect teachers' sense of efficacy. The most consistent effects were found for teacher control over instruction-related policies. Teachers who reported having more control also reported higher self-efficacy on average (b = .023, se = .013). Moreover, teacher control significantly reduced the dependency of teacher efficacy on student achievement (b = -.027, se = .010). Staff coooperation also affected mean levels of teacher efficacy (b = .018, se = .005), although this variable had no effect on the relationship between student achievement and perceived efficacy. The residual between-teacher variance in perceived self-efficacy, after controlling for these teacher variables, is estimated to be .117, a 16 percent reduction from the unconditional variance estimate shown in column 1 of Table 2, indicating that the expanded between-teacher model accounts for 16 percent of the inter-teacher variance in teachers' perceptions of self-efficacy.

The results above control also for the effects of teacher background, which are themselves of incidental interest in our analysis. We begin by discussing the effects of these variables on each teacher's "base." We found no effect of education or subject specialization on average teacher efficacy, some evidence of a sex effect, and a fairly substantial race effect. Given the codings of the variables, the results indicate that whites tend to feel more efficacious than do non-whites and that females tend to feel more efficacious than do males. We also estimated the effects of these variables on β_{1j}, the relationship between student achievement and teacher efficacy. The results showed effects of education (b = .122), race (b =

.141), and subject area (b = .175). The findings on the effect of education disconfirm our expectation that higher levels of education would weaken the effects of student achievement on teacher efficacy. Instead, it appears that the more highly educated a teacher, the more his or her sense of efficacy depends on the achievement levels of students assigned to a particular class. The other findings suggest that the dependence of self-efficacy on student achievement is higher for whites than for non-whites and higher for English teachers than for math teachers (social studies and science teachers did not differ from each other or from other teachers in this regard).

School Effects

As a final note, we included dummy variables for 13 schools to the inter-teacher model to represent the effects of the 14 schools in the sample on teacher efficacy. The results showed that although differences existed among schools, school effects contributed only slightly to the prediction of teacher efficacy. Moreover, inclusion of school effects led to no substantive changes in the results presented above for class- and teacher-level variables. Hence we have presented the simpler analyses in Table 2.

Discussion

This study was motivated by the recognition that educational outcomes depend heavily upon the capacity of teachers to act effectively under uncertainty. Optimal teacher performance cannot be prescribed in advance; rather, teachers must be counted upon to mobilize efficacious performances

under circumstances which vary across teaching episodes and cannot be fully anticipated. We reasoned that although pre-requisite teacher knowledge is a necessary ingredient in producing effective performances, it will not be sufficient. Effective action will depend also upon perceived self-efficacy, which requires a judgment that one can mobilize one's skills in the face of unanticipated challenges.

Because perceived self-efficacy is a necessary ingredient in producing effective teaching, its determinants are important to any conception of educational improvement. Our study was designed to investigate these determinants. Several studies which had a similar goal were reviewed. What distinguishes our study from others is the investigation of both intra-teacher and inter-teacher variation in the self-efficacy of secondary teachers. Following Bandura (1986), we reasoned that self-efficacy is contextually situated, such that the characteristics of the various classes to which secondary school teachers were assigned would exercise substantial influence on teachers' sense of efficacy. In this view, school improvement efforts should aim not just to increase teachers' global sense of efficacy, but also to neutralize the dependence of self-efficacy on teaching high achieving students, that is, to help teachers cope more effectively with their most challenging assignments, their low-achieving classes.

Our results confirmed the importance of class-to-class variation in secondary school teachers' sense of efficacy, with 43 percent of the total variance in teachers' efficacy perceptions reflecting intra-teacher variation across the 1026 classrooms we studied. The results also confirmed a number of our hypotheses about the sources of this variation.

We found that teacher perceptions of their students' engagement are highly predictive of self-efficacy. To the extent teachers perceive their students as engaged, they tend also to perceive themselves as able to provide good education.

The achievement level of the class to which the teacher is assigned is a highly important predictor of self-efficacy. Without controlling for engagement, student achievement level strongly predicts self-efficacy. Controlling for engagement substantially reduces this effect, indicating that the effect of achievement works largely through engagement. This finding is consistent with a view that teachers view low-achieving students as more difficult to teach largely because they view such students as less actively engaged. Even after engagement is controlled, however, a statistically significant effect of achievement remains, indicating that even if low-achieving classes were as engaged as high achieving classes, teachers would still view them as somewhat more difficult to teach well.

A teacher's level of preparation to teach a particular class is strongly predictive of the teacher's perceived self-efficacy with respect to that class. A subsequent analysis not reported here indicated that when teachers feel well prepared they tend also to perceive their students as more engaged. However, this cannot be the primary reason preparation is important to self-efficacy because even after engagement is controlled, a very large effect of preparation persists. This finding is quite sensible: given two classes which are equally engaged, the teacher will feel better able to provide a good education to the extent that teacher feels well prepared to teach the subject matter.

Our analysis confirmed the importance of the organizational settings in

which teachers work for perceptions of self-efficacy. Teachers who report a high level of control over important working conditions related to instruction, and those who report a high level of cooperation among staff, show elevated mean levels of self-efficacy. Moreover, control over instructionally- relevant working conditions also operates to neutralize the dependence of self-perceived efficacy of on student achievement. This important "setting-by-teacher" interaction effect indicates that such teacher control especially increases perceived self-efficacy in low-achieving classes, further confirming prior research (cf. Fuller et al., 1982).

In light of recent calls to increase teacher collaboration in schools and to provide for more teacher participation in school decision making, the effects of supportive organizational environments on teacher efficacy are worthy of further discussion. We think teacher collaboration might increase teachers' sense of efficacy because it allows teachers to provide one another with the strategies and confidence needed to produce effective teaching performances. Similarly, when teachers are able to wield effective control over policies that affect important working conditions, they appear to be better able to overcome the difficulties associated with teaching low-achieving students. However, the possibility exists that these findings in fact do not reflect the effects of organizational environments on teacher efficacy, but instead simply elaborate our portrait of an "efficacious" teacher. Such a teacher may seek out collaboration with colleagues when it is needed, and may be unusually efficacious, not only in teaching, but also in affecting organizational decisions which influence working conditions. Our data cannot distinguish among these alternative

explanations, and further study examining these alternative explanations is needed.

The effects of teacher background characteristics on teacher efficacy, though of incidental interest in this study, deserve further comment, especially since these were inconsistent with our initial hypotheses regarding teachers' level of education. As we saw, teachers' level of education had no effect on mean self-efficacy and tended to increase rather than reduce the strong positive relationship between student achievement and perceptions of self efficacy.

There are several possible explanations for why more highly educated teachers are more likely to suffer decreases in self-perceived efficacy when teaching lower achieving students. One possibility is that highly educated teachers have higher standards for their teaching and thus are more acutely aware than others of the discrepancy between these standards and the instruction they are able to deliver in low-achieving classes. Alternatively, it could be that the extra education received by teachers is not designed to enable them to cope with low-achieving students or that it makes them feel entitled to teach only the "best" classes. Of course, the findings could also reflect model misspecification. But if that is not the case, the findings in this paper call into question the calls of some reformers for increased levels of teacher education as a pathway to educational equity and improvement.

Findings on effects of sex and race on teachers' sense of efficacy also deserve comment. Previous research suggests that the social backgrounds of teachers affect their perceptions of the work environment (see, for example, Rowan, Raudenbush, and Kang, in press). The findings of

this study are consistent with this idea: male teachers tended to report lower self-efficacy than did female teachers. In addition, white teachers differed from non-white teachers in several important respects. Although white teachers reported somewhat higher mean levels of self-efficacy, their efficacy perceptions were significantly more dependent on student achievement levels than were those of non-whites.

Conclusion

Theoretical considerations, supported by the results of this study, suggest that, for each of their classes, the perceived self-efficacy of secondary teachers emerges when the teacher, having a particular background and set of interests, encounters a class constituted by a subject matter to be taught and by a set of students with a given level of academic preparation. The same teacher will report different levels of self-efficacy across different classes depending on how well prepared that teacher feels in teaching the varying subject matter of these classes and depending on how able the teacher perceives the students to be. To the extent teachers are able to successfully engage their students, they will feel more efficacious, though this effect is constrained by the teachers' level of preparation.

Secondary teachers face classes of widely varying prior achievement in part because of the system of "tracking" which stratifies students into high- and low-performing classes. Our data imply that assignment of teachers to low-track classes presents challenges to teachers that make it difficult for them to maintain elevated perceptions of self-efficacy. This appears especially true for the most advantaged teachers in the educational system -- highly educated and white. These teachers are particularly

vulnerable to decreases in self-efficacy when assigned to low-achieving classes. A topic worthy of future research is the extent to which a negative stigma accompanies assignment to such classes, contributing in part to the depressed self-efficacy associated with teaching those classes.

More positively, our study also provides encouragement to those who wish to pursue school organizational reform as an efficacy-enhancing strategy. In particular, the evidence suggests that increased opportunities for teacher collaboration can enhance perceived self-efficacy. And increased teacher control over working conditions can increase self-efficacy, especially with respect to low-achieving classes. In light of these findings, more research is needed to assess the effects of these organizational design changes on teachers' self-efficacy and to obtain further confirmation of the relationship between teachers' self-efficacy and effective teaching performance.

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Table 1 Descriptive Statistics for a) Class-Level and b) Teacher-Level Variables

a) Class-Level Variables

Variables	Coding and Range	Mean	St. Dev.
1. Class size[a]	(2, 39)	24.925	6.978
2. Student Grade Level[b]	(1, 4)	2.511	.941
3. Student Achievement[c]	1 = lower ach. levels 2 = average ach. levels 3 = higher ach. levels	2.134	.703
4. Percentage of Students Absent[d]	(0, 57.14)	12.943	9.191
5. Level of Preparation	0 = not well-prepared 1 = well-prepared	.777	.417
6. Level of Success	0 = not very successful 1 = very successful	.398	.490
7. Percentage of Actively Engaged Students	(60, 100)	82.277	14.036
8. Mathematics	0 = other 1 = math	.236	.425
9. Social Studies	0 = other 1 = social studies	.210	.407
10. English	0 = other 1 = English	.321	.467
11. Science	0 = other 1 = science	.234	.424

Notes to Table 1a

[a] Class size was transformed to a logarithmic scale and then centered around the grand mean in the HLM analysis.

[b] Student grade level was centered around the grand mean in the HLM analysis.

[c] Student achievement was centered around the grand mean in the HLM analysis.

[d] Logarithmic transformation was applied to Percentage of students absent. Furthermore, the transformed variable was centered around the grand mean in the HLM analysis.

b) Teacher-Level Variables

Variables	Coding and Range	Mean	St. Dev.
1. Years of Teaching Experience[a]	(1, 41)	20.198	8.997
2. Level of Education	0 = do not have master's degree 1 = have master's degree	.684	.466
3. Absenteeism[b]	1 = no days absent 2 = 1-2 days absent 3 = 3-4 days absent 4 = 5 or more days	2.338	1.024
4. Race	0 = others 1 = whites	.886	.319
5. Age[c]	(25, 70)	45.760	8.811
6. Sex	0 = female 1 = male	.57	.496
6. Principal Leadership[d] 13 items reliability = .9145	(-27.6, 16.51)	-.814	8.977
7. Teacher Control 9 items reliability = .7236	(-4.61, 6.10)	-.141	1.819
8. Staff Cooperation[f] 6 items reliability = .8285	(-15.08, 8.86)	-.250	4.656

Notes to Table 1b

[a]Logarithmic transformation was applied to Years of teaching experience. Furthermore, the transformed variable was centered around the grand mean in the HLM analysis.

[b]Absenteeism was centered around the grand mean in the HLM analysis.

[c]Age was centered around the grand mean in the HLM analysis.

[d]Principal leadership was centered around the grand mean in the HLM analysis.

[e]Teacher control was centered around the grand mean in the HLM analysis.

[f]Staff cooperation was centered around the grand mean in the HLM analysis.

Table 2: Predictors of Perceived Self-Efficacy

-Within-Teacher Predictors	Between-Teacher Predictors	Model 1 Base Only	Model 2 Intra-Teacher	Model 4 Student Engagement	Model 3 Inter-Teacher
Base	Base	.415(.025)	.148(.040)	.163(.037)	.033(.087)
	Education				.050(.051)
	Race				.178(.074)
	Sex				-.122(.050)
	T. Control				.023(.013)
	Staff Coop.				.018(.005)
	English-math				-.021(.061)
Student Achievement	Base		.176(.018)	.063(.021)	-.033(.058)
	Education				.122(.037)
	Race				.141(.055)
	T.Control				-.027(.010)
	English-math				.175(.046)
Grade	Base		.017(.014)	.018(.013)	.017(.014)
Level of Preparation	Base		.346(.040)	.323(.038)	.333(.040)
Class Size	Base		-.002(.040)	.054(.039)	.019(.040)
Student Engagement	Base			.0111(.0012)	
Intra-Teacher Variance, $\hat{\sigma}^2$		.106	.087	.082	.084
Inter-Teacher Variance, $\hat{\tau}^2$		.139	.124	.109	.117